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# James Cox's Silver Swan
# An eighteenth century automaton in the Bowes Museum

*Roger Smith*[1]

The Silver Swan (**illustration 25, cahier couleur**) is a life-sized automaton that has been in the Bowes Museum in the northern English town of Barnard Castle since 1872[2]. It was first exhibited in 1773 by the jeweller and entrepreneur James Cox (c. 1723-1800), as part of his « museum » of musical clocks and automata in Spring Gardens, London[3]. Before considering the Swan itself, it is important to understand the unusual circumstances which led to its creation.

Modern interest in early automata often focuses on their place in the development of advanced technologies like computing and robotics. In the eighteenth century, automata posed other scientific and philosophical questions, such as the difference between machines and living creatures, and what that meant for orthodox religion[4]. Cox himself was referring to such profound questions when he claimed that « the use made of natural and mechanic powers in several of [his museum's exhibits], offer[s] surely ideas *useful* and even *philosophical* enough to defend them from the reproach of being only glittering gewgaws[5] ». However, such objects also appealed more widely to an older popular fascination with magic and the marvellous.

Most of Cox's exhibits had been designed to satisfy the demand for mechanical curiosities by Asian élites, following in the tradition of mechanical music and automata that had developed in Renaissance Europe and spread eastwards through missionary activity and global trade from the late sixteenth century. From the beginning, such objects had been designed to delight the eyes as well as the ears of their wealthy owners; and although some European élites later developed a more « scientific » interest in clockwork technology, with greater emphasis on astronomical information and accurate timekeeping, lavishly ornamented musical clocks and automata retained their popular appeal. In Asia and especially China, where such objects were largely exotic imports available only to the rich and powerful, they were also coveted as expensive status symbols. This led to a growing export trade from Europe, while the articles themselves became increasingly costly, so that by the mid eighteenth century they were making a valuable contribution to reducing the trade gap caused by

European demand for Asian products like textiles, porcelain and tea[6].

James Cox became involved in this trade as a manufacturer and exporter in the 1760s, and it was a sudden collapse in the trade which led him to open his museum in 1772, intending to make money from the high entry charge of 10s 6d until the market recovered or he could dispose of his goods in some other way. (The eventual solution was a lottery, held in 1775.) Most of the museum's exhibits (56 by late 1773) were therefore typical of the export trade, including many musical clocks in lavishly gilded and « jewelled » cases, with automated features of varying sophistication. Some of these automations were visually striking but mechanically simple, like processions of painted figures; but others were more advanced, displaying « jewelled » stars and spirals which rotated and counter-rotated like miniature versions of the firework displays popular at that time. In marked contrast to such dazzling displays was the sophisticated simplicity of the Perpetual Motion clock (piece 47)[7], which utilised the variation in atmospheric pressure to power the movement. Its lengthy development and construction had been financed by Cox and it had probably been made for him by the immigrant mechanician Samuel Rehe. Since this clock was meant to appeal to an educated minority, its scientific credentials were underlined by its simple mahogany case, with large glass panels revealing the mechanism[8].

Between these two extremes were a smaller number of automata which combined both popular and philosophical appeal by imitating the movements of animals and people. Some were of a type familiar in Europe since the Renaissance, like mechanical carriages and elephants which moved their trunk, eyes and tail. There were also a few automata that, while still highly ornamented, were technically advanced, with mechanisms simulating more complicated natural movements. These included a flute-player (piece 43) which was perhaps similar to that made by Jacques Vaucanson (1709-1782) thirty years earlier; and a cage of singing birds (piece 42) which was more elaborate (but probably cruder) than those which Cox later obtained from Henry-Louis Jaquet-Droz (1752-1791). Neither of these pieces has survived, but another of Cox's automata is now in St Petersburg: this is the famous Peacock in the Hermitage Museum, which was originally one of a pair included in a smaller exhibition which Cox staged in Dublin in 1774[9]. After he became bankrupt in 1778, one of the Peacocks was exported to China and subsequently disappeared. The other was taken to St Petersburg in 1781 by Friedrich Jury, the German craftsman who had made it, and was bought by Prince Grigori Potemkin for 11,000 roubles (about £ 1,800 sterling). It was reassembled by the Russian clockmaker Ivan Petrovich Kulibin (1735-1818), and passed to the empress Catherine II on Potemkin's death in 1791. Although some elements, like the domed « pavilion » which originally enclosed it, have been lost, much of the Peacock's elaborate setting has survived and shows how a grand automaton would have looked in the eighteenth century.

Finally, there was the Silver Swan (piece 45 in Cox's museum), which is the subject of the remainder of this brief essay. In its current form, the Swan sits

in a « pond » of spiral glass rods which turn to simulate moving water, in which small fish are swimming[8]. (The leaves around the pond were added in the nineteenth century.) This simple setting focuses attention on the highly realistic movements of the Swan's neck and beak, as it preens its feathers and seems to pick a jumping fish out of the water and (improbably) swallow it. However, the visual impact of this piece would originally have been much greater, since it now lacks both the elaborate stand in the form of a crystal « rock » simulating falling water in which the pond was once placed, and the domed pavilion which enclosed it. The dome also supported an automated « rising sun » measuring three feet in diameter, and together these elements constituted a structure nearly 18 feet high (about 5,5 metres). This was considerably higher than the museum's other exhibits and made the Swan a very striking object indeed[10].

The body of the Swan is realistically modelled in silver, with the details of the feathers superbly engraved (**illustration 26, cahier couleur**) Unfortunately, there are no maker's marks on the silver. This body is essentially an empty shell, with the machinery driving the various automations and music being placed below the surface of the pond. The automaton's success in reproducing the natural movements of a swan is due to the extremely clever way in which the neck and beak are constructed. As can be seen (**illustrations 27 et 28, cahier couleur**), the silver outer rings of the neck conceal 24 brass rings which provide lateral rigidity with vertical flexibility. Fixed within the brass rings are a series of flat brass links, under which is a long tapered spring which helps to restore the neck to a vertical position when at rest. On the brass links are mounted roller-wheels carrying five chains controlled by cams below the base of the neck, which operate the movement of the neck, the opening of the beak and the action of the fish within it. The whole neck is also counterpoised with sliding weights. As Matthew Read has observed, the entire mechanism is not only well-finished but is finely balanced in design and action[11]. Although unlike the mechanisms in other automata of this period, including the Peacock, it shows no signs of being a prototype, so we are left wondering what inspired it. Nor is there any firm information about the identity of the designer and maker. Some scholars have plausibly attributed the mechanism to Cox's chief workman up to 1773, John Joseph Merlin (1735-1803), an immigrant mechanician from near Liège[12]. However, no similar work by him around this date has yet been found, and although he later worked on two small automata of walking and dancing « Silver Ladies » for his own mechanical exhibition, these were unfinished when he died and are now lost[13].



This ignorance about the maker of the Swan reflects the commercial context within which Cox obtained his articles for export. Cox himself was not technically trained: having started his career as a « toyman », he became an entrepreneur and merchant in the 1760s, concentrating on identifying markets, specifying the goods required, and providing the finance needed for production and export to the Far East. As was customary in the horological trades, he often placed his name on the dials of clocks and

watches that he sold, and he sometimes placed it more prominently as « maker » on a major piece with which he had been directly involved. However, those who saw his exhibition in London or ultimately bought such objects in India or China were not interested in the artists and craftsmen who had made them, so they remain largely anonymous: it is only by accident that the Perpetual Motion clock can be attributed to Rehe and the Peacock to Jury.

Cox obtained articles in various ways. Until hit by falling demand in 1772, he employed his own huge workforce of 800-1000 workers. Of course, only a small minority of these would have been located in the workshop in Shoe Lane, supervised by Merlin and paid by Cox directly. These directly employed journeymen, who included several highly skilled immigrants[14], probably worked on the more exceptional pieces, as well as producing those smaller articles with distinctive ornaments that suggest the use of patterns owned by Cox himself. Otherwise, most of his employees were independent subcontractors and suppliers, with their own workshops and journeymen – a system of « outworking » traditional in the luxury trades, that permitted a flexible subdivision of labour while also spreading the financial risk. In addition, Cox evidently bought some articles in a finished or semi-finished state from leading London clock and watch makers like James Upjohn; and this became his usual practice in later years when, after his bankruptcy in 1778, access to finance became difficult. He then had to rely on trade credit from independent suppliers with their own sources of capital, like the Swiss clock and automata maker Henry-Louis Jaquet-Droz, who worked in London from late 1775 but did not become a major supplier to Cox until the early 1780s, retaining a London workshop for this purpose after he returned to Switzerland in 1783.



How Cox obtained the Swan is not known, but the possibilities are limited by the high cost of development and manufacture, which few independent makers could have undertaken simply as a speculation. The cost of making the two Peacocks is known to have been about £2,000 each (*c.* 50 000 livres tournois), and the cost of the Swan in its original state was probably similar[15]. Given this high cost, if Merlin was indeed the designer, it was probably made in Cox's own workshop, with independent specialists supplying parts like the silver body and the musical movement, though the lack of ornament makes it difficult to identify any standard Cox features. On the other hand, if it was designed and made by an independent maker, he probably had a prior agreement with Cox and perhaps an arrangement for interim financial support, which may be how Friedrich Jury could make the two Peacocks.

It will be evident that much about the making of the Swan remains unknown, but the general circumstances behind its creation are clearer. Such sophisticated automata might inspire philosophical thoughts among some contemporary European observers, but most of these pieces were produced as objects of trade, and especially for export to Asia. And like their counterparts in Renaissance Europe, what their new Chinese and Indian owners wanted from this advanced technology was not scientific or economic utility, but an ability

to astonish and delight – an ability that automata like the Swan and the Peacock possess to this day.

## Notes

1. Roger Smith is an independent historian studying the organisation of horological and related trades (including automata) in the eighteenth century. He has acted as historical adviser to museums in the UK and elsewhere, and has published extensively – most recently, the autobiography of a London watchmaker : *The Life and Travels of James Upjohn*, London, Antiquarian Horological Society, 2016, co-edited with John Leopold. Contact [smith_roger@btinternet.com].

2. I am greatly indebted to Matthew Read, now head of the clock conservation course at West Dean College, for advice on the Swan's mechanism based on his conservation work in 2008. I am also grateful to Dr Jane Whittaker, head of collections, Bowes Museum, for permission to use images of the Swan. Information about the Swan is on the Bowes Museum website [http://www.thebowesmuseum.org.uk/Collections/ExploreTheCollection/TheSilverSwan.aspx. It can be seen performing on YouTube: https://www.youtube.com/watch?v=p9dcg-o4efg].

3. There is a short biography of James Cox by the present author in *The Oxford Dictionary of National Biography*, Oxford 2004 (available online).

4. For example, the arguments for and against « materialism » by the scientist and theologian Dr Joseph Priestley, in *London Review of English and Foreign Literature*, London, 1775. Eighteenth century approaches to automata are discussed in Simon Schaffer, « Enlightened Automata », *in* William Clark, Jan Golinski and Simon Schaffer (éd.), *The Sciences in Enlightened Europe*, (Chicago & London 1999), p. 126-165.

5. From the « Advertisement » prefaced to editions of the *Descriptive Catalogues* of Cox's Museum, London 1772-1773. Le terme « gewgaws » peut se traduire par « babioles ».

6. Roger Smith, « The sing-song trade: exporting clocks to China in the eighteenth century », *Antiquarian Horology*, 30/5, March 2008, p. 629-658.

7. Piece numbers for exhibits are from the *Descriptive Inventory (etc),* London, 1774, which covers the museum at its largest.

8. Now in the Victoria & Albert Museum, London [http://collections.vam.ac.uk/item/O297335/longcase-clock-cox-james/].

9. Yuna Zek and Roger Smith, « The Hermitage Peacock », *Antiquarian Horology*, 28/6, June 2005, p. 699-715.

10. For an artist's impression of the original structure, based on the catalogue description with advice from the present author, see *Country Life*, 13 May 2008, p. 85.

11. Personal communication to the author.

12. See Michael Wright's catalogue entry and detailed technical description of the Swan in Anne French (ed.), *John Joseph Merlin. The Ingenious Mechanick*, exhibition catalogue, London, 1985, E5, p. 125-126.

13. The Silver Ladies were unfinished *c.* 1800, when Charles Babbage (1792-1871) saw them in Merlin's workshop. Babbage, who became a famous mathematician and developed an advanced calculating machine, later bought the Dancer and completed it. *Ibid.*, A13, p. 46.

14. For Cox's use of foreign workers, see the present author's paper to a conference organised by the university of Neuchâtel 30.3.2012 (publication of conference proceedings forthcoming).

15. Contemporaries placed much higher values on some of Cox's exhibits – up to £ 100,000! That seems absurd unless the jewels in their decoration were real – and large. (Those that survive are usually made of glass or merely small chips of precious stones.) Of course, when demand was high in Asia, the *selling* price could be much higher.